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REMARKS

This application contains allowed claims 1, 19, 20, 32-40, 42 and 44 and newly added claims 45-58. Claims 45-48 consist of independent claims 45 and 50 and dependent claims 46-49 and 51-58. Independent claims 45 and 50 are substantially revised versions of allowed claims 1 and 19, respectively, with the additional requirement that the recording of information on the recording medium is achieved by the use of near-field light alone and without the use of a coil to locally heat the recording medium.

During prosecution, the Examiner rejected independent claims 1 and 19 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,831,797 to Schaenzer et al. ("Schaenzer") in view of U.S. Patent No. 5,808,973 to Tanaka ("Tanaka"). Schaenzer was cited as disclosing all features of the invention recited in claims 1 and 19 with the exception of a microscopic aperture. The Examiner pointed out that Schaenzer utilizes a solid immersion lens 51 in an upper surface of a slider rather than a probe having a microscopic aperture in the bottom surface of a slider. Tanaka was cited as disclosing this feature.

As noted above, newly added claims 45 and 50 exclude the use of a coil for recording information to a recording medium.

Schaenzer discloses a near-field recording head having a near-field probe 30 mounted to a slider 20. The near-field probe comprises a solid immersion lens formed by a lens cap 50 disposed on a top surface of the slider and the body of the slider 20, and electrical conductors 52 formed in the shape of a coil. The conductors 52 are coiled about a mesa 54 which is carried on an air bearing surface 56 of the slider. The coils are provided to locally heat a recording medium to enable data to be written to a recording medium. The mesa 54 is provided in the near-field probe 30 of Schaenzer solely to enable the conductors 52 to be formed into a coil as illustrated in the sectional view of Fig. 2 of Schaenzer. The mesa 54 does not enable the recording of data by the use of near-field light alone and without the use of a coil, as required by independent claims 45 and 50.

As pointed out by applicants in their specification, a conventional recording device employing a flying head configuration produces a film of air between a lower surface of a recording head serving as an air bearing and the surface of a recording medium. The distance between the air bearing surface of the recording head and the surface of the recording medium is as much as several dozen to several hundred nanometers.

When attempting to employ a flying head configuration in a near-field recording device, high resolution and high efficiency recording and reading of data utilizing near-field light are not attainable. One reason for this is that a distance of several dozen to several hundred nanometers between the air bearing surface of the recording head and the recording medium is too large to obtain the high-intensity near-field light needed for high resolution. The intensity of near-field light decreases exponentially as distance increases. Since the recording head and the recording medium are spaced far from each other relative to the wavelength of near-field light, only low intensity near-field light can be produced. Thus, near-field light having an intensity sufficient to achieve high resolution recording or reading of data is not attainable.

Thus, if a flying head configuration is adopted for use in a near-field recording apparatus, such a recording apparatus must be provided with a light emitting element or light detecting element positioned on the top surface of the recording head opposite the air bearing surface having a microscopic aperture provided therein. The distance between the aperture and the light emitting or detecting element is equal to the thickness of the slider of the flying head. Typically, this distance is large, such that the intensity of

light illuminating the microscopic aperture by a light emitting element (or illuminating the light detecting element from the microscopic aperture) is small because the intensity of such light decreases proportionately with the square of the distance.

Schaenzer overcomes this problem by forming electrical conductors 52 in the shape of a coil about a mesa 54 for the purpose of locally heating a small spot on a recording medium to record information thereon.

On the other hand, the present invention overcomes the foregoing problem in an entirely different manner by forming a microscopic aperture to protrude below the bottom surface of the slider to increase the amount of energy produced by near-field light. In this manner, the present invention avoids the need for the mesa-and-coil structure of Schaenzer. In fact, independent claims 45 and 50 expressly exclude the use of a coil for recording information.

The only motivation for replacing the solid immersion lens and coil-and-mesa structure of Schaenzer with a microscopic aperture protruding below the bottom surface of the slider is provided by applicants' specification, which discloses that such modification enables efficient use of near-field light for reading and writing of data to a recording medium. Tanaka provides no such motivation.

Tanaka would not have motivated one of ordinary skill in the art to modify the probe 30 of Schaenzer to provide a microscopic aperture protruding below the bottom surface of the slider without a coil. Although Tanaka discloses a microscopic aperture formed in a substrate and would have fairly suggested replacing the near-field producing components of the Schaenzer probe therewith, such components do not include the mesa 54 since the mesa 54 is formed below the near-field producing components of the probe solely to enable formation of the coil.

Stated otherwise, even if Schaenzer were modified to incorporate the microscopic aperture of Tanaka, such modification would not result in a microscopic aperture protruding below the bottom surface of the slider. The only motivation for such structure is found in applicants' specification, which cannot be used in a hindsight manner to serve as the basis for an obviousness rejection.

The present invention enables use of the flying head configuration in a near-field recording apparatus by forming a probe of a microscopic aperture protruding from a bottom surface of a slider. A gap is formed between a recording medium and the bottom surface of the slider. Near-field light is produced or converted into propagation light by the microscopic aperture, and the recording medium and the

microscopic aperture interact through the near-field light when the slider undergoes scanning movement relative to the recording medium to effect recording or reading of information on the recording medium.

For the foregoing reasons, Tanaka does not suggest modifying the structure of Schaenzer to provide a microscopic aperture protruding from the bottom surface of a slider. Even if Schaenzer were modified to provide the microscopic aperture of Tanaka in the slider, this modification would not result in a microscopic aperture protruding from the bottom surface of the slider as required by independent claims 45 and 50.

Furthermore, no prima facie case of obviousness can be made based on the prior art of record. The question is whether it would have been obvious from a fair reading of the prior art reference as a whole to replicate the claimed invention. Since Schaenzer utilizes a mesa for the purpose of forming a coil, removing the coil would destroy the invention. It is impermissible to do this. The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification. See Carl Schenck, A.G. v. Nortron Corp., 713 F.2d 782, 787, 218 USPQ 698, 702 (Fed. Cir. 1983), and In re Sernaker, 702 F.2d 989, 995-96, 217 USPQ 1, 6-7 (Fed. Cir. 1983) (both citing In re Imperato, 486 F.2d 585, 587, 179 USPQ 730, 732 (CCPA 1973)).

If the coil were removed from the Schaenzer device, the device would be rendered inoperable for its intended purpose. The near field light would not be of sufficient intensity to record information and the device would not work. See In re Schulpen, 390 F.2d 1009, 1013, 157 USPQ 52 ,55(CCPA 1968). In effect, Schaenzer teaches away from any such modification.

Accordingly, applicants respectfully submit that newly added claims 45-58 patentably distinguish over the prior art of record.

In view of the foregoing amendments and discussion,
the application is now believed to be in condition for
allowance. Accordingly, favorable action on the merits is
most respectfully requested.

Respectfully submitted,

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